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A Parallel Solver for CFD based on the Alternating Anderson-Richardson Method

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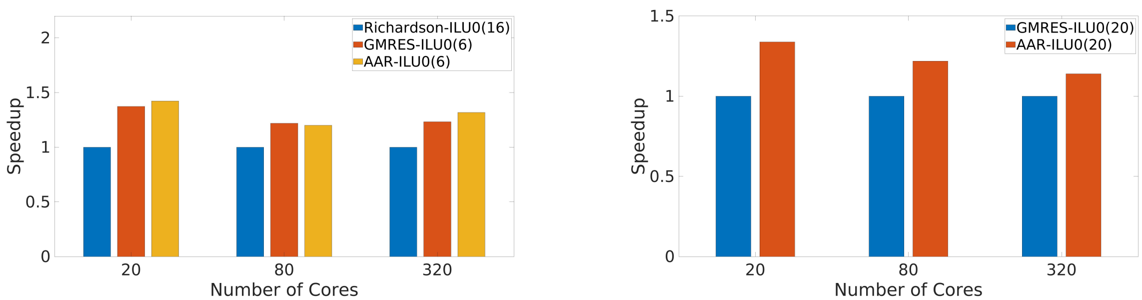
The Alternating Anderson-Richardson (AAR) method has been recently shown to exhibit good performance when solving problems in distributed parallel computers [1]. This research will extend and investigate the performance of the AAR method to solve CFD problems using a modern compressible flow solver by comparing its performance and scalability against the state-of-the-art linear solvers, such as Richardson method and Generalised Minimal RESidual (GMRES), for solving large, sparse linear systems of equations arising from CFD applications. Preliminary results using a range of turbomachinery test cases demonstrate that the current AAR implementation offers significant performance improvement when compared to the Richardson method, Figure 1-a). The speedup of AAR with respect to GMRES is less significant due to the load imbalancing between partitions. However, it can achieve higher speedup if more number of linear solver iterations is used due to the subsidence of the effect of load imbalancing, Figure 1-b).



(a) Low No. of Iterations (b) Large No. of Iterations

Figure 1: Speedup

REFERENCES

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